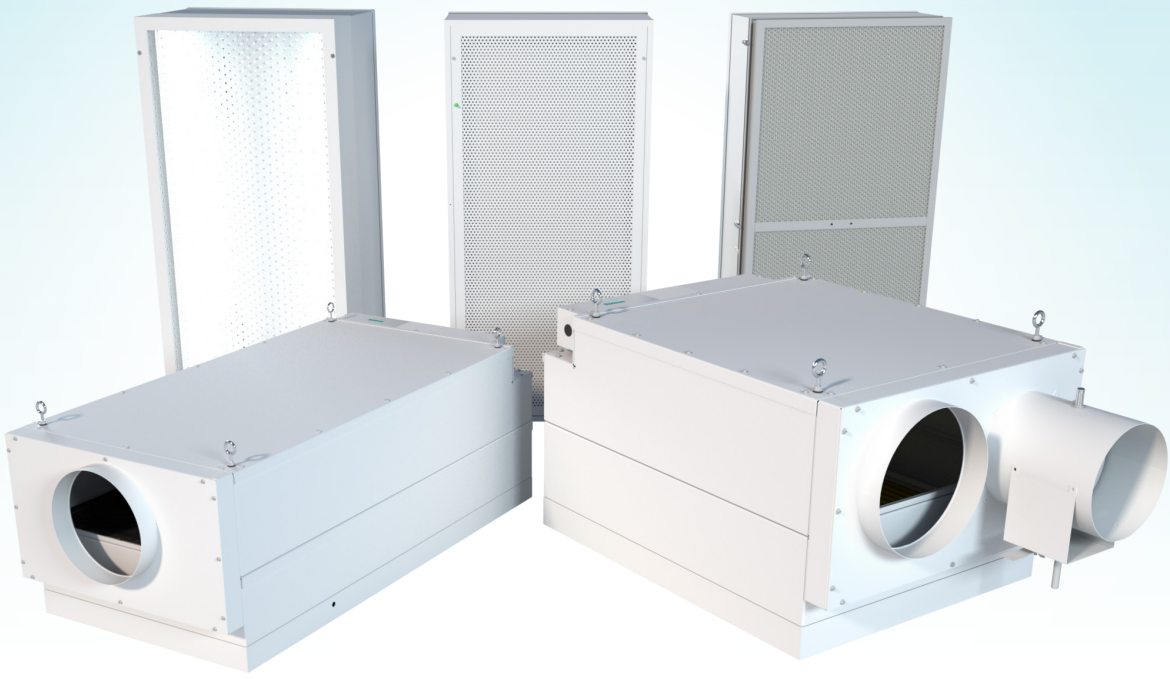
KEYSTONE
Clean Air Solutions

Krown

Fan Filter Units



INSTALLATION + SERVICE MANUAL

v001 – Issue Date: 02/23/22

Read and Save These Instructions

Warning! To reduce the risk of fire, electrical shock, or injury to persons, observe the following:

A. Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction.

B. When cutting or drilling into wall or ceiling, do not damage electrical wiring and other hidden utilities.

C. Use this unit only in the manner intended by the manufacturer. If you have any questions, contact the manufacturer:

In the United States
2975 20 Crestridge Drive, Suwanee, GA, 30024
Ph: 470.702.9560

D. Disconnect the unit from the electrical power source before attempting any service. Electrical service should be performed by a licensed electrician or authorized service technician.

E. When performing any type of maintenance on the Krown Fan Filter Units, be careful to reduce as much as possible the potential for introducing the internals of the unit to dirt, dust, and debris that may be present in the unit's external environment.

F. To reduce the risk of injury to persons, install the unit at least 7ft above grade or in ceiling.

Before You Start

Shipping Information

Inspect all cartons and boxes for flaws and shipping damages. If anything is discovered to be damaged, contact the shipping company and file a freight claim.

Filter Information

Ensure that all HEPA/ULPA filters are stored in a clean, dry location in a vertical position, as labeled on the carton. Do not open the HEPA/ULPA filters until they are ready to be installed in the Krown Fan Filter Units. All construction in the space should be complete, the site and upstream air should be clean so as not to unnecessarily load the filter.

Ensure ductwork is balanced to scheduled flow and that both the space and ductwork is clean, free of debris, and ready for operation prior to installation of filter. To ensure fan filter units are properly balanced, read **Technical Note: Design with VAV/ Constant Flow Boxes and Ducted Applications** prior to starting installation.

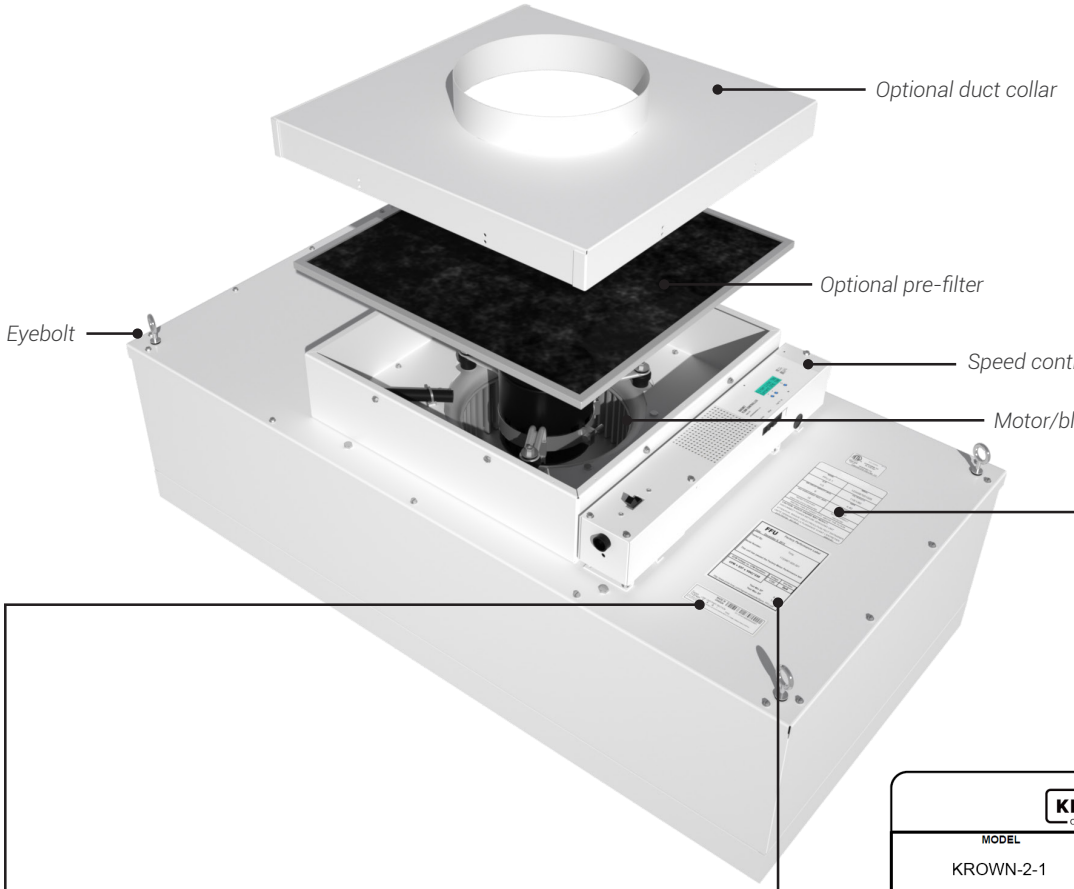
A minimum of two (2) people will be required to install the filters.

NOTE: Extreme caution should be taken to avoid contact with filter media. Touching filter media may result in filter failure. Damage to filters can occur during installation or during leak qualification testing. The filters supplied by Keystone have been 100% tested and certified by the manufacturer to be free of defects and leaks. Keystone cannot accept responsibility for damage that occurs after shipment, whether through transit, handling or installation, and will not replace filters under Keystone standard warranty.

Introduction

Krown Fan Filter Units are ceiling module diffusers consisting of a fan/motor assembly and Roomside Removable (RSR), or Bench Top Replaceable (BTR) filters. The module is designed to provide unidirectional vertical airflow of filtered, clean air over a cleanroom space.

Krown Fan Filter Units will have four (4) stickers located on the back of the plenum. For ease of troubleshooting assistance, replacement parts, and general factory assistance, it is recommended that the order number, and model line string be used as reference. This information can be found on the Factory Label.



ETL LISTED
CONFORMS TO UL STD 507
Intertek 9801655
CERTIFIED TO CAN/CSA STD C22.2 NO. 113

KEYSTONE Clean Air Solutions

MODEL	SERIAL
KROWN-2-1	1234567001005
H.P.	VOLTS/PH/CYC
1/3	115/1/60
MIN CIRCUIT AMPACITY (MCA)	AMPS
6	4.80
MAX OVERCURRENT PROT. (MOP)	R.P.M
15	1400
TESTED TO MIN & MAX OPERATING STATIC PRESSURES	MOTOR THERMALLY PROTECTED

INSTALL FAN AT LEAST 7 FT. ABOVE THE FLOOR

CAUTION: SHOCK HAZARD MAY RESULT,
DISCONNECT POWER BEFORE SERVICING UNIT

ATTENTION: RISQUE D'ÉLECTROCUTION PEUT ENTRAÎNER
UNITÉ DÉBRANCHER LA PUISSANCE AVANT L'ENTRETIEN

DATE PRINTED: 2021-06-23 268933-001

KEYSTONE Clean Air Solutions
MADE IN CANADA
O113744100020003A001

ORDER	LINE	UNIT	PART SECTION		TAG:
1137441	2	3	A	-	

KROWN-X-X/S/1/24/48/RSR/FC/ECM/115/12/CF/HEPA/BFC///////TM8////MBAC/FBAC//WPFH/PL-AL/F-AL/PL-Mill/F-Mill

Module Installation

The Krown Fan Filter Units will come completely assembled from the factory with the exception of the HEPA/ULPA filters, which will ship in its own carton, and the speed controller wall kits (if selected).

Sample line string for Room Side Replaceable filter:

*Krown-X-X//I/SUPPLY/24/48//**RSR**/HEPA/FC/ECM/115/CF/R+TMB/FL+ML+BACnet/BFC/TC/DSW-115//ASSP///WPF/PL-AL/*
F-AL/PL-B12/F-B12

Step 1: Remove fan filter unit from shipping carton and inspect for any damage.

Step 2: If unit is Bench Top Replaceable (BTR) install the filter, refer to the filter installation section of this manual for instructions. If unit is Room Side Replaceable (RSR), proceed directly to next step.

Sample line string for Bench Top Replaceable filter:

*Krown-X-X//I/SUPPLY/24/48//**BTR**/HEPA/FC/ECM/115/CF/TMB//ECMSC/TC/DSW-115//ASSP///WPF/PL-AL/F-EM/PL-WM/*
F-EM

Step 3: Raise the unit through the ceiling grid at an angle until entire unit is above the grid

Step 5: Secure the unit to the overhead structure using the eyebolts located on the back of the unit.

Step 6: Adjust and level the unit so that it rests on the tees and there is adequate compression on the gasket to warrant a tight seal.

Ensure that ceiling grid is properly gasket/sealed to prevent infiltration of unfiltered air from the ceiling plenum into the room side.

Above steps are manufacturer's suggested hanging techniques, always make sure to follow all local building codes, including seismic where applicable.

Unit Eyebolts for Mounting

Speed Controller Installation & Operation

Refer to Factory Label to determine which speed controller is on the unit and use the following tableto find the appropriate installation instructions.

Sample line string: *Krown-X-X//I/SUPPLY/24/48//RSR/HEPA/FC/ECM/115/CF/R+TMB/FL+ML+BACnet/**BFC**/TC/DSW-115//ASSP///WPF/PL-AL/F-AL/PL-B12/F-B12*

Speed Controller	Page Reference
PSCSC/WK	4
ECMSC	5
BFC	8

PSCSC/WK

Sample line string: *Krown-X-X//I/SUPPLY/24/48//RSR/HEPA/FC/PSC/115//R+TMB/FL+ML/**PSC-WK**/TC/DSW-115//ASSP///WPF/PL-AL/F-AL/PL-B12/F-B12*

If unit does not have the wall kit (WK) option, proceed to step 4.

Sample line string: Krown-X-X//I/SUPPLY/24/48//RSR/HEPA/FC/PSC/115//R+TMB/FL+ML/**PSCSC**/TC/DSW-115/PC-115/ASSP///WPF/PL-AL/F-AL/PL-B12/F-B12*

Step 1: Locate pre-installed electric box for wall-mounted speed controller.

Step 2: Wire speed controller according to wiring diagram. Wall-mounted speed controller will be wired in series with the motor.

Step 3: Attach the wall-mounted controls faceplate to the electrical box using the screws provided.

Step 4: Wire the unit according to appropriate wiring diagram. If Power Cord (PC) option is selected, simply insert plug end into electrical socket.

Sample line string: Krown-X-X//I/SUPPLY/24/48//RSR/HEPA/FC/PSC/115//R+TMB/FL+ML/PSCSC/TC/DSW-115/**PC-115**/ASSP///WPF/PL-AL/F-AL/PL-B12/F-B12*

Step 5: If the unit has an RSR filter install the filter now, refer to the filter installation section of this manual for instructions.

Step 6: Ensure proper voltage is hooked up to the unit.

Step 7: Proceed to the balancing section of this manual.

NOTE: Clockwise rotation will increase airflow, counter-clockwise rotation will decrease airflow.

NOTE: If unit is ducted, refer to **Technical Note: Balancing Ducted Units**.

PSC Speed Controller with Wall Kit Option

ECMSC

Installation

Sample line string: *Krown-X-X//I/SUPPLY/24/48//RSR/HEPA/FC/ECM/115/CF/R+TMB//**ECMSC**/TC/DSW-115//ASSP///WPF/PL-AL/F-AL/PL-B12/F-B12*

Sample line string: *KrownCS-X-X//I/ECM/ECMSC/**WMSC-30**////*

Step 1: Wire the unit according to appropriate wiring diagram. If Power Cord (PC) option is selected, simply insert plug end into electrical socket.

Step 2: If ECMSC is to be controlled using analog voltage signal from BAS (others) or Price WMSC, please remove ECMSC from control box. Connect 0-10VDC & COMMON to BAS SIGNAL & BAS COMMON on back of ECMSC (make sure to feed wires through grommet on control box). Re-fasten ECMSC to control box.

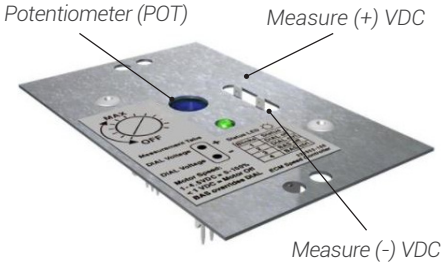
Step 3: If the unit has an RSR filter install the filter now, refer to the filter installation section of this manual for instructions.

Step 4: Ensure proper Voltage is hooked up to the unit.

Step 5: Proceed to the following page to determine the initial test point voltage (VDC) based on your scheduled flow rate.

WMSC-30

ECMSC Speed Controller



ECMSC Airflow Setpoint

Step 1: Determine initial test point voltage (VDC) based on scheduled flow rate.

To calculate FPM from a CFM value use the equation for the respective unit style and size from the following table.

Size	RSR	BTR
2x2	CFM/2.30	CFM/3.31
2x3	CFM/3.82	CFM/5.13
2x4	CFM/5.33	CFM/6.95

Supply - Constant Flow – Forward Curve

Velocity	24x24		24x36		24x48	
FPM	BTR - FC	RSR - FC	BTR - FC	RSR - FC	BTR - FC	RSR - FC
45-140	VDC = (CFM-45) ÷ 97	VDC = (CFM-33) ÷ 67	VDC = (CFM-76) ÷ 145	VDC = (CFM-14) ÷ 127	VDC = (CFM-88) ÷ 198	VDC = (CFM-67) ÷ 157

Supply - Constant Torque – Forward Curve

Velocity	24x24		24x36		24x48	
FPM	BTR - FC	RSR - FC	BTR - FC	RSR - FC	BTR - FC	RSR - FC
45-95	VDC = (CFM+174) ÷ 309	VDC = (CFM+168) ÷ 253	VDC = (CFM+177) ÷ 322	VDC = (CFM+142) ÷ 273	VDC = (CFM+139) ÷ 336	VDC = (CFM+311) ÷ 373
95-140	VDC = (CFM+19) ÷ 207	VDC = (CFM+47) ÷ 174	VDC = (CFM-70) ÷ 197	VDC = (CFM-79) ÷ 167	VDC = (CFM-138) ÷ 212	VDC = (CFM-81) ÷ 190

Supply - Constant Torque – Backward Curve

Velocity	24x36		24x48	
FPM	BTR - BC	RSR - BC	BTR - BC	RSR - BC
45-140	VDC = (CFM+240) ÷ 450	VDC = (CFM+332) ÷ 415	VDC = (CFM+185) ÷ 459	VDC = (CFM+403) ÷ 514

Reverse Flow - Constant Flow – Forward Curve

Velocity	24x24	24x48
FPM	RSR - FC	RSR - FC
45-140	VDC = (CFM-24) ÷ 68	VDC = (CFM-61) ÷ 158

Reverse/Exhaust Flow - Constant Torque – Forward Curve

Velocity	24x24	24x48
FPM	RSR - FC	RSR - FC
45-95	VDC = (CFM+90) ÷ 197	VDC = (CFM+141) ÷ 308
95-140	VDC = (CFM+90) ÷ 197	VDC = (CFM-90) ÷ 196

Supply, 24 x 48 in., RSR, FC Wheel, Constant Torque @ 450cfm

FPM = CFM/5.33 = 450/5.33

FPM = 84

VDC = (CFM+311)/373 = (450+311)/373

VDC = 2.04V

NOTE: The calculated VDC value is intended as a starting point; actual VDC value may differ slightly depending on field variables.

Step 2: If using potentiometer/manual adjustment, rotate the potentiometer (POT/DIAL) dial on the outside of the box with a screwdriver until the test point voltage is achieved.

NOTE: ECM Speed Controllers have 2 modes: manual adjust and BAS (Building Automation System). Standard manual control outputs are shown below:

Measurement Tab Voltage	Motor Control
0 - 1 VDC	Off
1 - 4.5 VDC	0-100%
4.5 - 5 VDC	100%

The speed controller will automatically ignore the potentiometer (POT/DIAL) when a BAS signal is detected (BAS Input Signal >1).

VDC equations are for potentiometer (POT/DIAL) manual adjustment only (0-1 BAS input signal). The VDC equations are based on a 1-5 Volt scale. The BAS input voltage is a 2-10 VDC scale, and therefore VDC calculated for a given CFM using the equation must be doubled to achieve that CFM using the BAS input.

BAS Voltage	Response	Notes
0 - 1 VDC	Local control mode using push buttons	Local setpoint can be adjusted from 0 - 100% using push buttons
1 - 2 VDC	Motor Off	Recommended sending a 1.5 VDC signal to command motor off
2 - 10 VDC	Modulating Control	2 - 10 VDC modulates motor in accordance with VDC equations

Example: If using a BAS signal, to calculate appropriate starting voltage, first calculate the VDC (as shown in above example)

VDC = 2.44 V

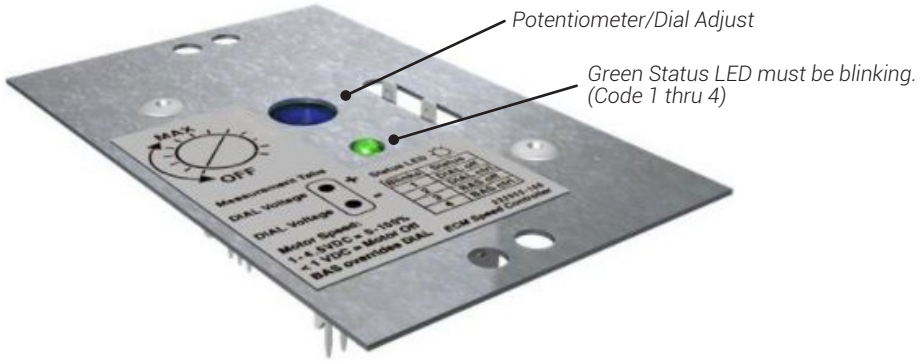
Then double this value

BAS Input Voltage = VDC*2

BAS Input Voltage = 2.44*2

BAS Input Voltage = **4.88V**

Speed Controller Adjustment



Step 3: Wait a few seconds for the ECM motor to adjust its speed and then verify fan airflow with measurements at the unit face using a flow hood. Adjust the POT/DIAL, or BAS input signal to reach desired airflow as required.

Step 4: Proceed to balancing section of this manual.

BACnet Flow Controller (BFC)

Installation

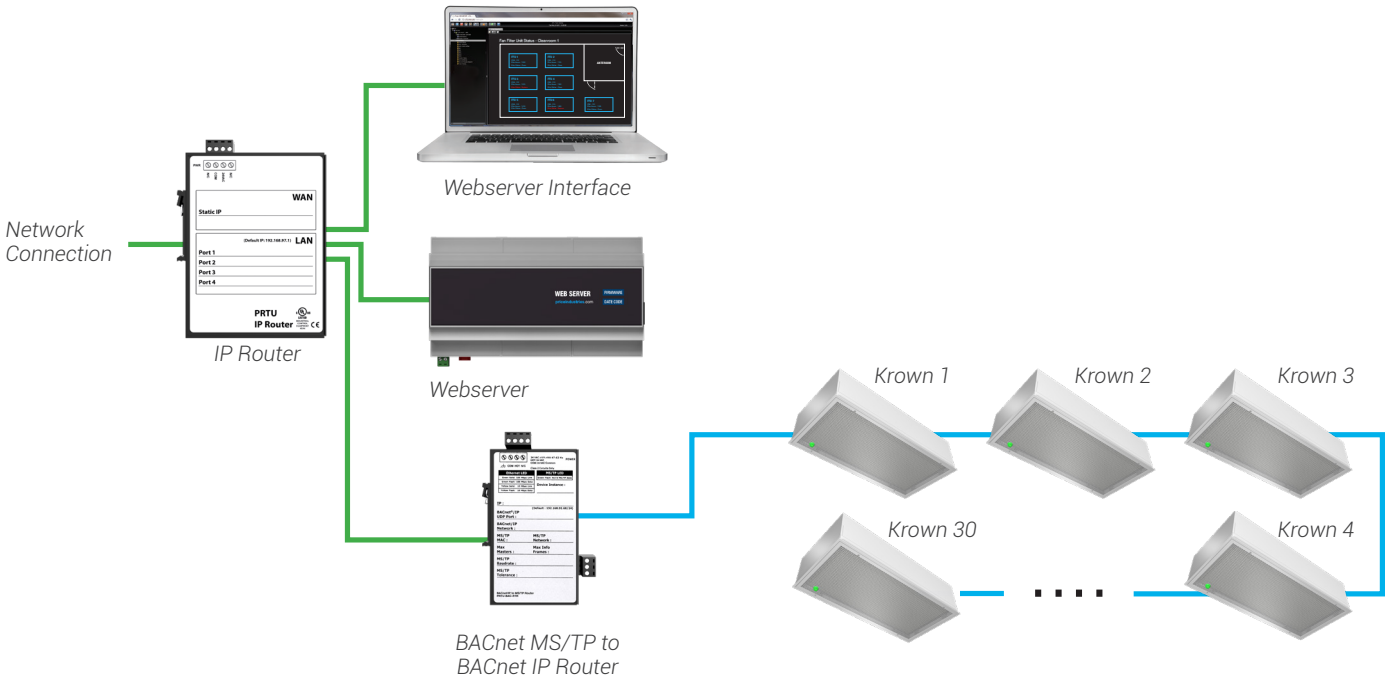
Sample line string: Krown-X-X//I/SUPPLY/24/48//RSR/HEPA/FC/ECM/115/CF/R+TMB/BACnet/**BFC**/TC/DSW-115//ASSP///WPF/PL-AL/F-AL/PL-B12/F-B12

Step 1: Wire unit according to appropriate wiring diagram. If Power Cord (PC) option is selected, simply insert plug end into electrical socket.

NOTE: Polarity is important and must be observed. It is also vital that the 24 VAC common side of the transformer be Earth grounded.

Step 2: Hook up applicable BACnet, and/or local Building Automation System (BAS) according to wiring diagram. Multiple units can be daisy chained together using optional RJ45 cables. If using BAS or Local Set point, reference the airflow setpoint section on the next page.

Daisy Chained Krown Fan Filter Units



Step 3: Wire the unit according to the appropriate wiring diagram. If power cord option is selected, simply insert the plug end into the electric socket.

Sample line string: Krown-X-X//I/SUPPLY/24/48//RSR/HEPA/FC/ECM/115/CF/R+TMB/BACnet/BFC/TC/DSW-115/**PC-115**/ASSP///WPF/PL-AL/F-AL/PL-B12/F-B12

Step 4: If the unit has an RSR filter install the filter now, refer to the filter installation section of this manual for instructions.

Step 5: Ensure proper Voltage is hooked up to the unit.

For additional information on BACnet, and the BFC controller, refer to the *BACnet Wiring Guidelines*, and *BFC Manual* available on KeystoneCleanAir.com

Service Tool

The BFC Service Tool can be used for cases with limited access to the control box. The service tool connects to the RJ12 port on the BFC board to allow full control up to 6 feet away from the control panel.

Sample line string: *KrownCS-X-X//I/ECM/BFC/**BFC-ST**//250002-600*

BFC Airflow Setpoint

Step 1: Determine if BFC will be controlled using local control, BAS analog voltage signal, or BACnet. The control mode can be confirmed by observing the cycling status readout on the LCD.

NOTE: The control hierarchy is BACnet > BAS > Local. The control mode is based on the highest level of control provided.

Step 2: For Local or BACnet control, determine the setpoint from the appropriate airflow formula for your model in the tables below.

If BFC is being controlled by BAS analog voltage signal, refer to "ECMSC Airflow Setpoint" section for proper input voltage (Note this will be 2X the VDC value shown in the tables).

Set-point (ECM%) ranges from 0% - 100%

To calculate FPM from a CFM value use the equation for the respective unit style and size from the following table.

	RSR	BTR
2x2	CFM/2.30	CFM/3.31
2x3	CFM/3.82	CFM/5.13
2x4	CFM/5.33	CFM/6.95

Supply - Constant Flow - Forward Curve

Velocity	24x24		24x36		24x48	
FPM	BTR - FC	RSR - FC	BTR - FC	RSR - FC	BTR - FC	RSR - FC
45-140	ECM% = (CFM ÷ 3.40) - 42	ECM% = (CFM ÷ 2.35) - 43	ECM% = (CFM ÷ 5.08) - 44	ECM% = (CFM ÷ 4.45) - 32	ECM% = (CFM ÷ 6.93) - 42	ECM% = (CFM ÷ 5.50) - 41

Supply - Constant Torque - Forward Curve

Velocity	24x24		24x36		24x48	
FPM	BTR - FC	RSR - FC	BTR - FC	RSR - FC	BTR - FC	RSR - FC
45-95	ECM% = (CFM ÷ 10.82) - 12	ECM% = (CFM ÷ 8.86) - 10	ECM% = (CFM ÷ 11.27) - 13	ECM% = (CFM ÷ 9.56) - 14	ECM% = (CFM ÷ 11.76) - 17	ECM% = (CFM ÷ 13.06) - 5
95-140	ECM% = (CFM ÷ 7.25) - 26	ECM% = (CFM ÷ 6.09) - 21	ECM% = (CFM ÷ 6.90) - 39	ECM% = (CFM ÷ 5.85) - 42	ECM% = (CFM ÷ 7.42) - 47	ECM% = (CFM ÷ 6.65) - 41

Supply - Constant Torque - Backward Curve

Velocity	24x36		24x48	
FPM	BTR - BC	RSR - BC	BTR - BC	RSR - BC
45-140	ECM% = (CFM ÷ 15.75) - 13	ECM% = (CFM ÷ 14.53) - 6	ECM% = (CFM ÷ 16.07) - 17	ECM% = (CFM ÷ 17.99) - 6

Reverse/Exhaust Flow - Constant Flow - Forward Curve

Velocity	24x24	24x48
FPM	RSR - FC	RSR - FC
45-140	ECM% = (CFM ÷ 2.38) - 39	ECM% = (CFM ÷ 5.53) - 40

Reverse/Exhaust Flow - Constant Torque - Forward Curve

Velocity	24x24	24x48
FPM	RSR - FC	RSR - FC
45-95	ECM% = (CFM ÷ 6.90) - 16	ECM% = (CFM ÷ 10.78) - 15
95-140	ECM% = (CFM ÷ 6.90) - 16	ECM% = (CFM ÷ 6.86) - 42

Supply, 24 x 48 in., RSR, FC Wheel, Constant Torque @ 550cfm

FPM = CFM/5.33 = 550/5.33

FPM = 103

ECM% = (CFM/6.65)-41 = (550/6.65)-41

ECM% = 42%

NOTE: The calculated ECM% value is intended as a starting point; actual ECM% value may differ slightly depending on field variables.

Step 3: For local control, adjust at the speed controller using the up and down arrows. For BACnet control, adjust point "AO3 - ECM Setpoint" on Front End System.

Step 4: For BAS analog voltage control, ensure correct voltage is applied to AI1 & COM based on the VDC equations provided in the tables. Also refer to table below for BAS control responses.

BAS Voltage	Response	Notes
0 - 1 VDC	Local control mode using push buttons	Local setpoint can be adjusted from 0 - 100% using push buttons
1 - 2 VDC	Motor Off	Recommended sending a 1.5 VDC signal to command motor off
2 - 10 VDC	Modulating Control	2 - 10 VDC modulates motor in accordance with VDC equations

The VDC equations are based on a 1-5 Volt scale. The BAS input voltage is a 2-10 VDC scale, and therefore VDC calculated for a given CFM using the equations must be doubled to achieve that CFM using the BAS input.

NOTE: The calculated ECM setpoint is a starting point; actual value may differ slightly depending on field variables.

NOTE: The BAS signal will override the local setpoint using a remote 0 – 10 VDC signal. If the BAS signal drops below 1 VDC local control (via the up/down buttons) is restored.

Step 5: Wait a few seconds for the ECM motor to adjust its speed and then verify fan airflow with measurements at the supply outlets using a flow hood. Adjust voltage to reach desired airflow as required.

Step 6: Proceed to Balancing section of this manual.

Filter Installation

Room Side Replaceable Filter (RSR)

Sample line string: Krown-X-X//I/SUPPLY/24/48//**RSR**/HEPA/FC/ECM/115/CF/R+TMB/BACnet/BFC/TC/DSW-115//ASSP///WPF/PL-AL/F-AL/PL-B12/F-B12

Please refer to the *Vangaurd Room Side Replaceable Filter (RSR) Quick Start Guide*.

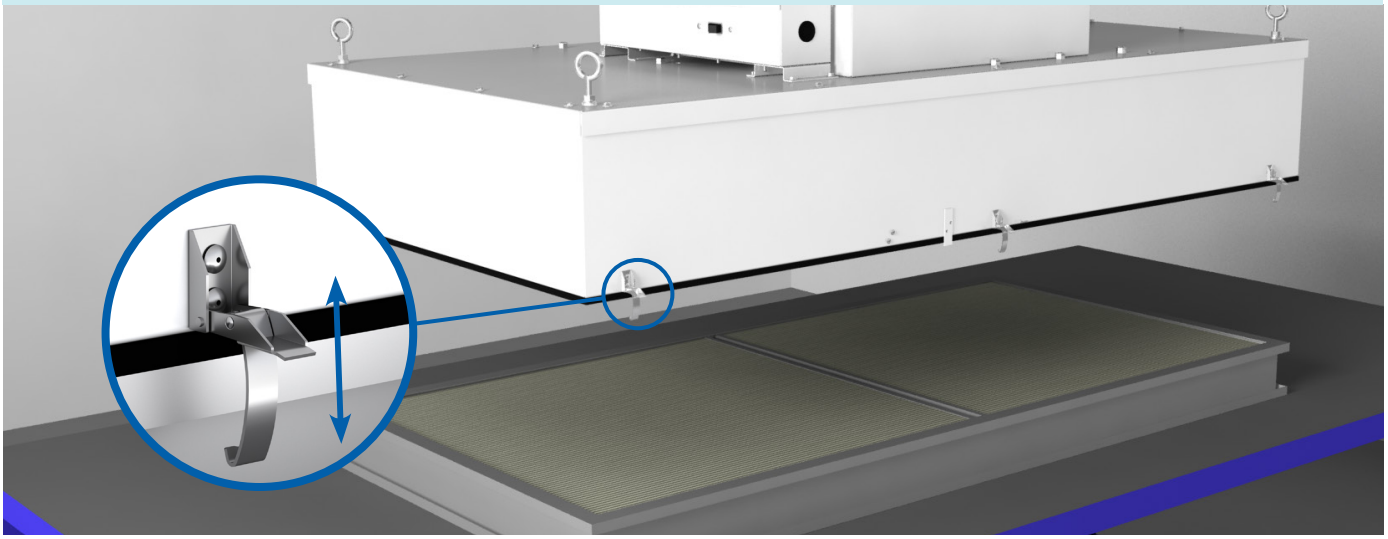
RSR

Bench Top Replaceable Filter (BTR)

Sample line string: Krown-X-X//I/24/48/**BTR**/FC/ECM/115/10//CF//HEPA//BFC////DSW-115//PC-115//TMB/ASSP///FL+ML+BACnet/// WPFH/PL-AL///PL-B12/

Please refer to the *Vangaurd Bench Top Replaceable Filter (BTR) Quick Start Guide*.

BTR



Accessories

Aerosol Sample Static Pressure Port (ASSP)

Sample line string: Krown-X-X//*I/SUPPLY/24/48//RSR/HEPA/FC/ECM/115/CF/R+TMB/BACnet/BFC/TC/DSW-115/PC-115/**ASSP**/INJ//WPF/PL-AL/F-AL/PL-B12/F-B12*

Every Krown Fan Filter Unit from Keystone is supplied with an aerosol sample/static pressure port.

The ASSP is a ¼" port used for measuring plenum static pressure as well as sampling aerosol concentrations above the filter.

On the Krown Fan Filter Unit with BTR filter there are two ports on the center strip of the filter than can function as the ASSP, however if the LED indicator option has been selected, one port will be used for the LED installation.

ASSP on BTR unit

Optional Aerosol Injection Port (INJ)

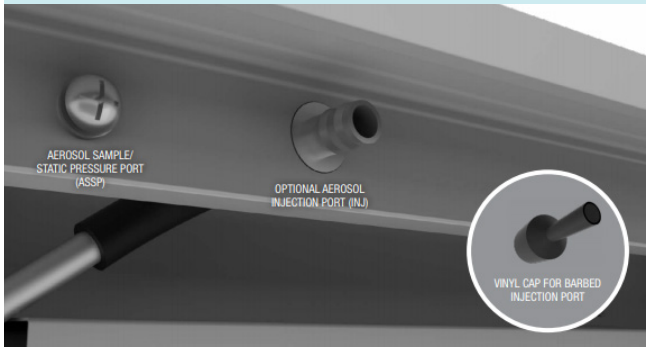
Sample line string: Krown-X-X//*I/SUPPLY/24/48//RSR/HEPA/FC/ECM/115/CF/R+TMB/BACnet/BFC/TC/DSW-115/PC-115/ASSP/**INJ**//WPF/PL-AL/F-AL/PL-B12/F-B12*

The Krown Fan Filter Unit with RSR filter can be ordered with an optional aerosol injection port for easier commissioning.

The INJ is a barbed port for 1/2" inner diameter tubing, used to inject aerosol above the filter for aerosol testing.

For instructions on use of the ASSP and INJ, please refer to the *INJ Aerosol Injection Port User Manual*.

ASSP & INJ RSR unit



Filter/Motor Indicator LED (ML/FL) - PSC Units

Sample line string: Krown-X-X//*I/SUPPLY/24/48//RSR/HEPA/FC/**PSC**/115//R+TMB/**FL+ML**/PSC-WK/TC/DSW-115//ASSP///WPF/PL-AL/F-AL/PL-B12/F-B12*

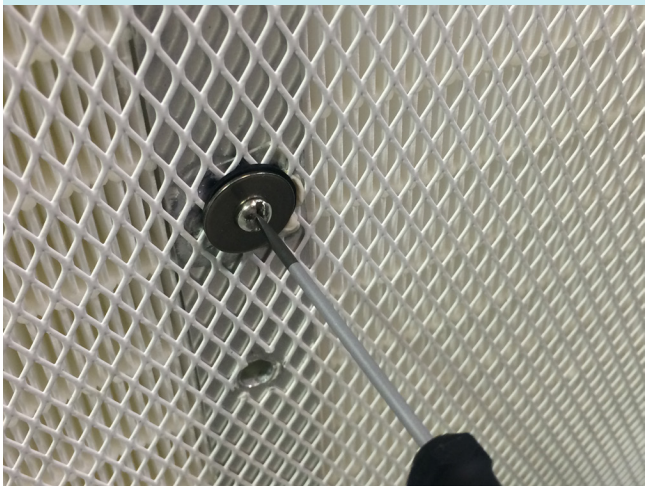
LED Installation (BTR Units only)

Step 1: Take LED cable assembly out of Krown-X-X Plenum.

Step 2: Remove well nut in center port of BTR filter.

Cable Assembly

Static Pressure Port

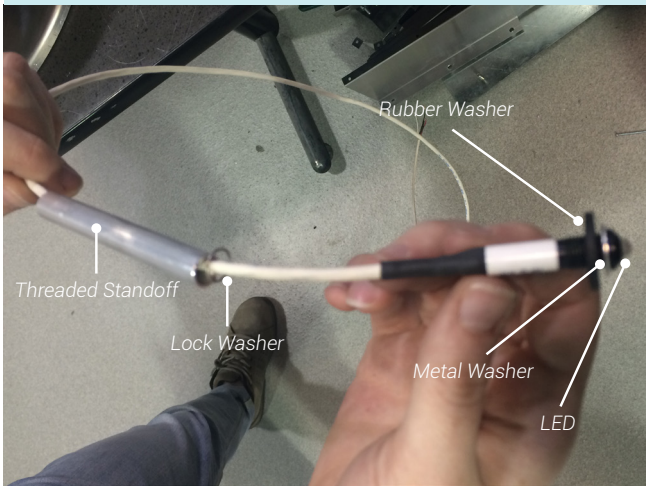


Step 3: Remove threaded standoff and lock washer from LED cable assembly.

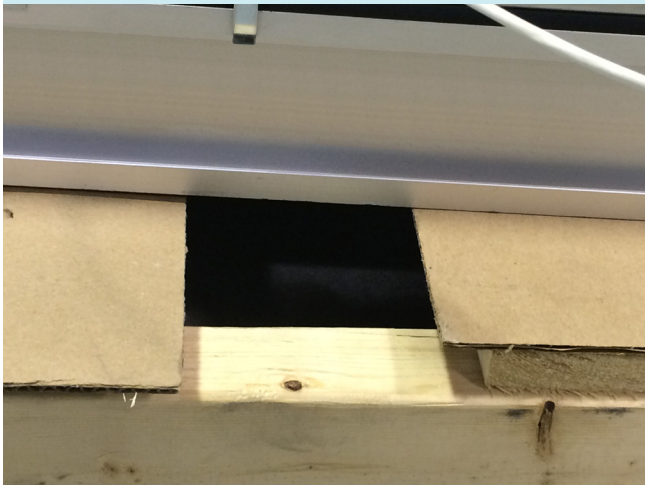
Step 4: Thread cable through static pressure port on face of BTR filter.

NOTE: It is recommended to rest the filter frame on 2x4 lumber to protect the LED light from breaking.

LED Threaded Standoff



Filter Position for LED Installation



Step 5: Put lock washer and threaded standoff back on cable and tighten to LED.

BTR Face Installed LED

Threaded Standoff Through Filter Channel

Step 6: With two (2) people holding the unit, pull cable back through plenum until plenum can rest on top of filter.

Step 7: Install the filter, refer to the filter installation section of this manual.

Step 8: Refer to wiring diagram (located in control box) to connect LED leads to terminal block.

NOTE: If unit has BFC speed controller, LED leads will need to be connected to the BFC controller instead of the terminal block.

Cable Assembly

LED Operation

Option	Code	LED Color	Action	Notes
Filter LED	FL	Green	None	Indicates normal operation until filter pressure drop exceeds calibrated pressure drop (factory set at 1.5x clean filter pressure).
		Yellow	Change Filter	Indicates filter pressure drop has exceeded calbirated setting (factory set at 1.5x clean filter pressure.
Motor LED	ML	Green	None	Indicates normal motor operation when the static pressure is above 0.1" w.g.
		Red	Troubleshoot Motor	Indicates motor is not in operation, and that unit static pressure is below 0.1" w.g.

Calibration

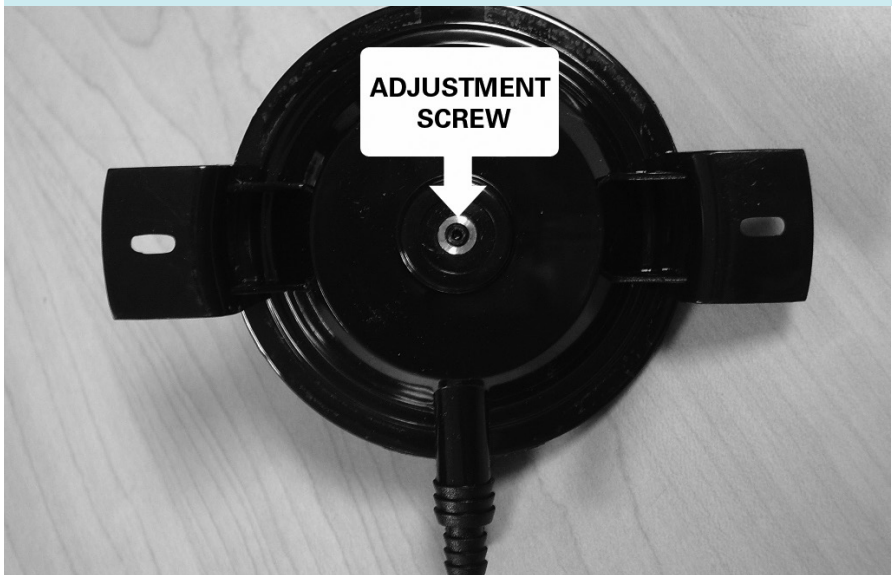
Filter LED will come factory set to activate at the pressure drops listed in the Table below.

Pressure @ 90fpm [in w.g.]	1.5x Clean Filter [in w.g.]
0.4	0.6

If different set points are desired, they can be adjusted as follows:

Step 1: Remove Loctite from adjustment screw hole.

Pressure Switch Adjustment Screw



Step 2: Calculate number of turns required based on difference between factory set point and desired set point using the following chart.

Example:

HEPA filter with desired set point of 0.9 in w.g.

Number of turns at 0.9 in w.g. = 4

Number of turns at factory set point of 0.6 in w.g. = 2.2

Number of turns to field set = 4 – 2.2 = 1.8 (approximately)

NOTE: Maximum available pressure setting is 1.0" w.g. Do not exceed 4 ½ turns (total).

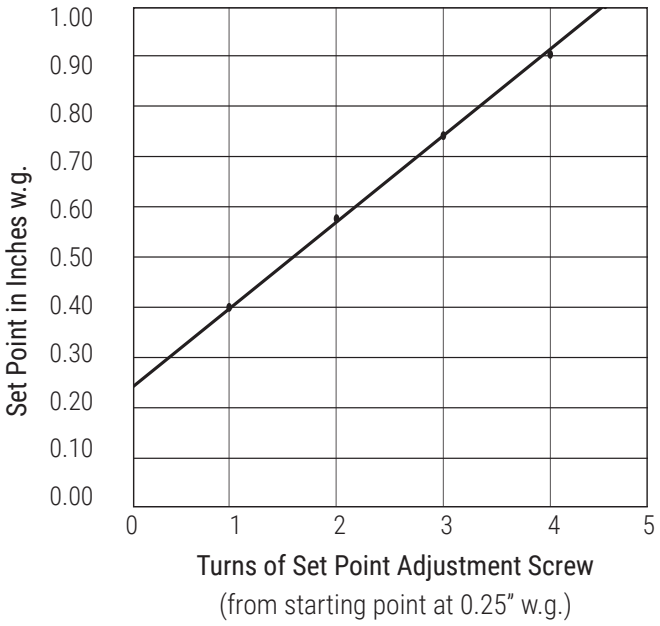
Step 3: Turn screw clockwise the number of turns calculated above. You will need a 1.5mm hex Allen wrench

Step 4: To check filter pressure set point and/or to fine tune**,** insert Magnehelic gauge into the static pressure port (located along knife edge of diffuser – diffuser face must be removed to access).

Step 5: Using an obstruction (piece of cardboard or equivalent), slowly increasing pressure on the unit by blocking off more and more of the diffuser face until the LED turns from green to yellow.

Step 6: Take pressure measurement at point the LED changed color and rotate the adjustment screw until desired pressure set point is reached.

RSR Filter LED Set Point Adjustment



Filter/Motor Indicator LED (ML/FL) - ECM Units

Sample line string: Krown-X-X//I/SUPPLY/24/48//RSR/HEPA/FC/***ECM***/115//R+TMB/***FL+ML+BACnet***/BFC/TC/DSW-115//ASSP///WPF/PL-AL/F-AL/PL-B12/F-B12

LED Operation

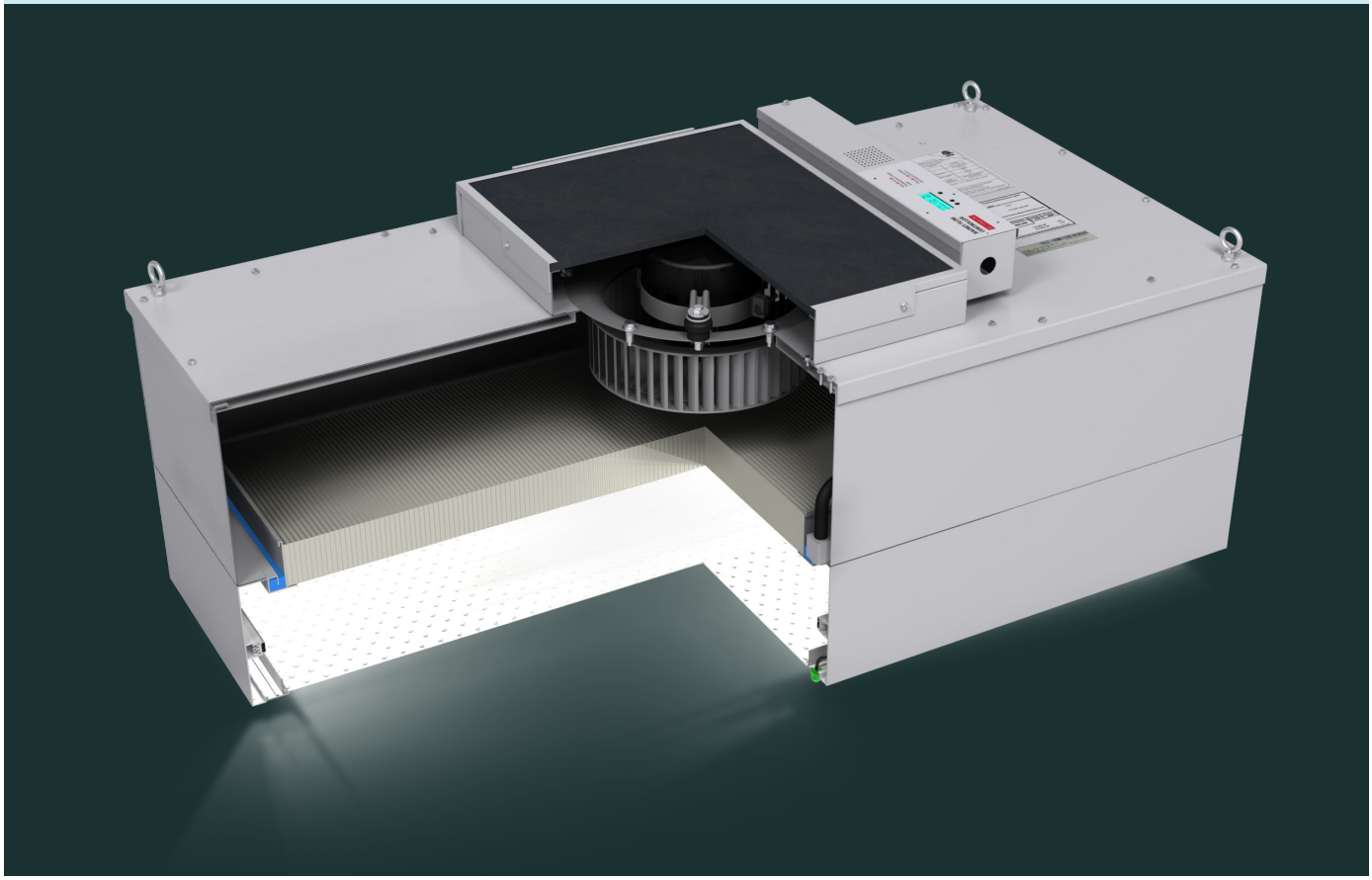
LED Color	Unit Status*	Action	Notes
Green	Normal	None	Indicates normal operation until pressure drop exceeds calibrated pressure drop (factory set a 1.5x clean filter pressure).
Yellow	Ftr Loaded	Change or calibrate filter	Indicates filter pressure drop has exceeded calibrated setting (factory set at 1.5x the clean filter pressure).
Red	Off	Adjust setpoint / check control mode	Indicates motor setpoint is 0%. If alternate setpoint is expected please check control mode.
Blinking Red	Low Pressure	Troubleshoot motor	Indicates unit pressure is below 0.1 in. w.g. and motor setpoint is above 0%. Please contact Applications (criticalenvironments@priceindustries.com).

*Unit status is shown on BFC LCD screen or as BACnet point: "MV1 - Unit Status"

Integrated LED Lighting (Krown-L)

For details on installation and wiring please refer to the *RDC Remote Driver Cabinet Manual on KeystoneCleanAir.com* on KeystoneCleanAir.com.

Krown-L



Balancing

Technical Note: Design with VAV/Constant Flow Boxes and Ducted Applications

In applications where the fan filter units will be ducted with upstream VAV, constant flow boxes, valves, or other airflow devices that may have varying airflows, or modes, a constant flow program is not recommended.

In systems where two controllers are trying to compensate to adjust to a constant airflow, the system will be unable to stabilize. This results in constant adjustment of both controllers until the Krown Fan Filter Unit motor shuts off. The ECM with constant torque motor program or PSC motor is suggested for this type of application.

The Krown Fan Filter Unit is designed to overcome the pressure drop of the filter only. The motor is not intended to pull air down supply ductwork, nor to experience a positive static pressure at the inlet forcing air through the fan. Krown Fan filter units should be installed in a system where the inlet static will be neutral or slightly negative.

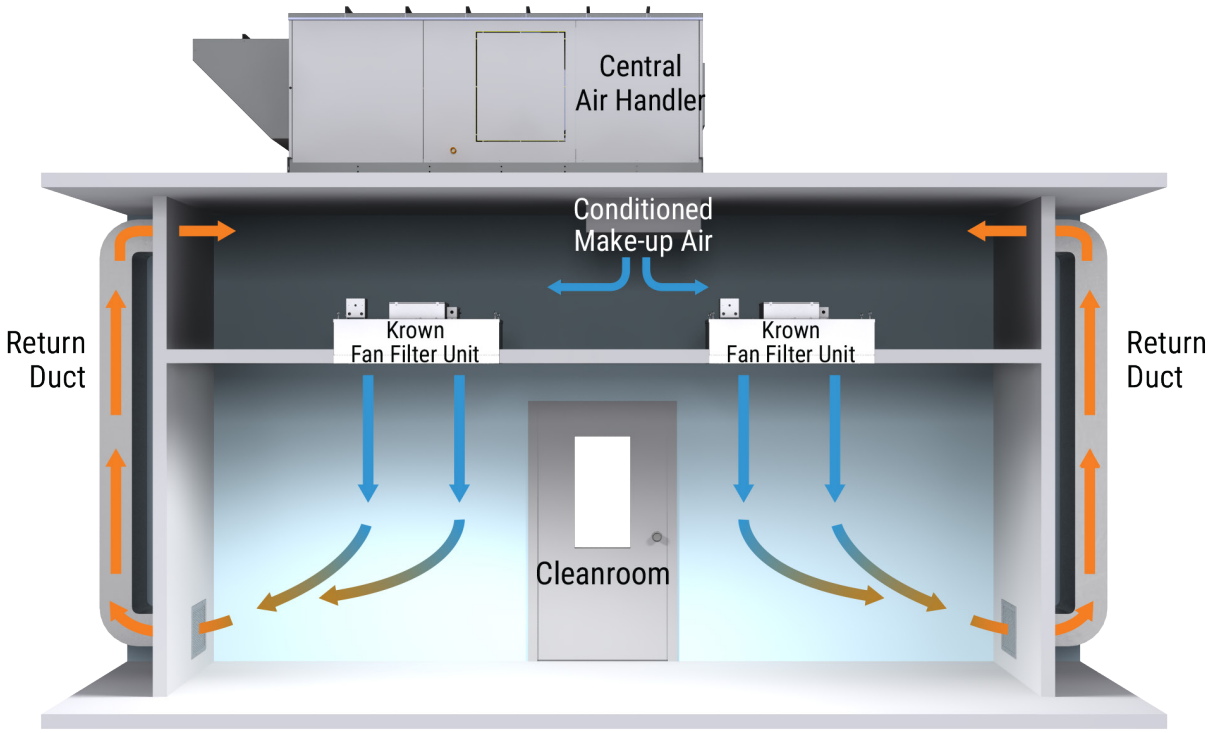
In ducted applications, it is critical that primary air be balanced prior to installing the Krown Fan Filter unit. The primary air controls should be locked in position post balancing, and the is installed and running. Similarly, the Krown Fan Filter series should be bench-set by using a flow hood and adjusting the speed controller, as required, to the same balanced, primary airflow rate before the is mated with the duct. Alternatively, the Technical Note: Design with VAV/Constant Flow Boxes and Ducted Applications can also be followedl.

To prevent a high static pressure build up at the Krown Fan Filter series during start up, the Krown Fan Filter unit should be energized prior to the system. This helps to prevent the possibility of backwards rotations of the blower wheel, which will eventually lead to the motor shutting off.

For any additional information, or troubleshooting assistance on systems and design with Krown fan filter units used in sequence with a variable upstream air source, contact contact Keystone Clean Air Solutions help at KeySupport@KeystoneCleanAir.com, or dial (470)-604-9938.

Balancing Un-Ducted Supply Units

Un-ducted Supply Units, Negative Pressure Plenum



Step 1: Ensure the unit and filter is properly installed.

Step 2: Turn on Krown Fan Filter Unit and set to desired airflow. See *Airflow Setpoint* section to determine initial setpoint.

Step 3: Measure airflow using flow hood and compare against scheduled flow. Adjust speed controller as necessary to achieve design airflow.

Balancing Ducted Supply – Pressure Independent and Dependent Airflow Control

NOTE: If there is a pressure independent device upstream of the Krown Fan Filter Unit then PSC or ECM with constant torque motors should be used.

If Krown Fan Filter unit is not already installed:

Step 1: Set Krown Fan Filter Unit with filter installed on benchtop and set to desired airflow. See Airflow Setpoint section to determine initial setpoint.

Step 2: Confirm airflow using a flow hood and adjust speed controller as required.

Step 3: Ensure each supply air duct is balanced to scheduled airflow and matches Krown Fan Filter Unit set point.

Step 4: Turn off primary air source.

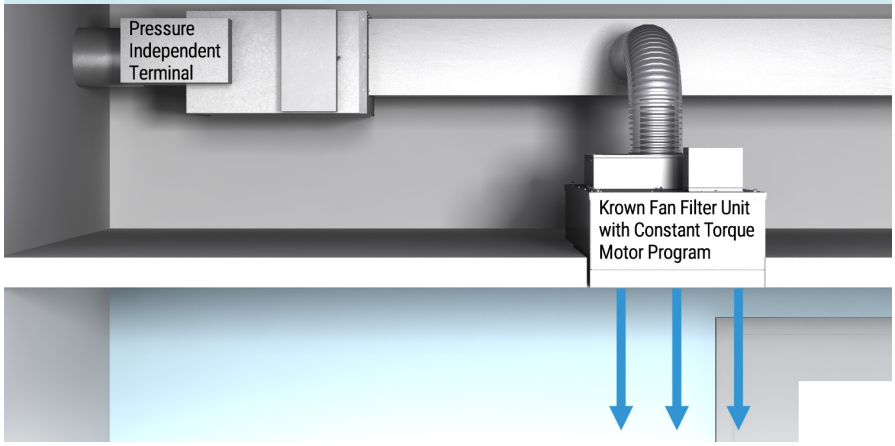
Step 5: Install Krown Fan Filter Unit into ceiling, connect ductwork.

Step 6: Turn all Krown Fan Filter Units on – ensure all are running before proceeding to next step.

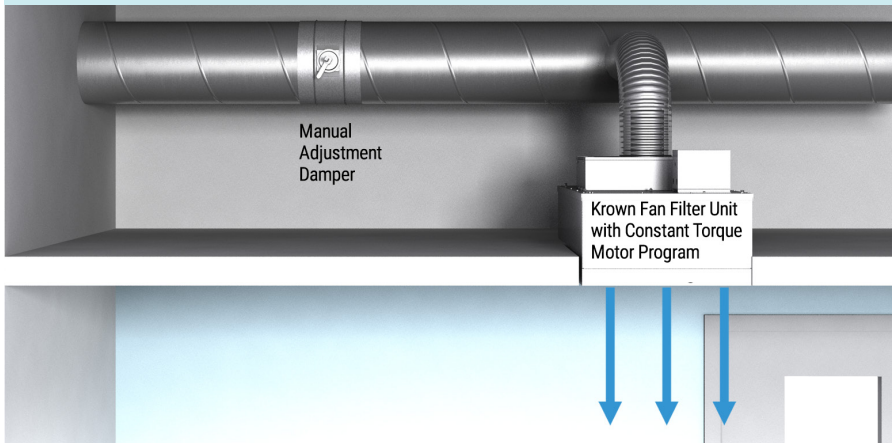
Step 7: Turn on primary air source.

Step 8: Measure airflow using flow hood and compare against scheduled flow. Krown Fan Filter Unit inlet static should be verified to be neutral. See table below if proper operation is not achieved.

Ducted Unit: Constant Torque Krown Fan Filter Unit with Upstream Pressure Independent Terminal



Ducted Unit: Constant Flow Krown Fan Filter Unit with Upstream Pressure Dependent Terminal and Manual Damper



If the Krown Fan Filter Unit is ducted and removing the duct is not possible, follow the below instructions for balancing:

Step 1: Turn off primary air source.

Step 2: Install an air pressure measurement device (i.e. Pitot tube) in the duct prior to the Krown Fan Filter Unit inlet.

Step 3: Power up Krown Fan Filter Unit and set speed controller to desired airflow. See Airflow Setpoint section to determine initial setpoint.

Step 4: Power up the airflow control device. (Ductwork should have been previously balanced)

Step 5: Read the inlet pressure.

Step 6: Measure airflow using flow hood.

Step 7: Using the table below, adjust Krown Fan Filter Unit controller, or upstream airflow device as required

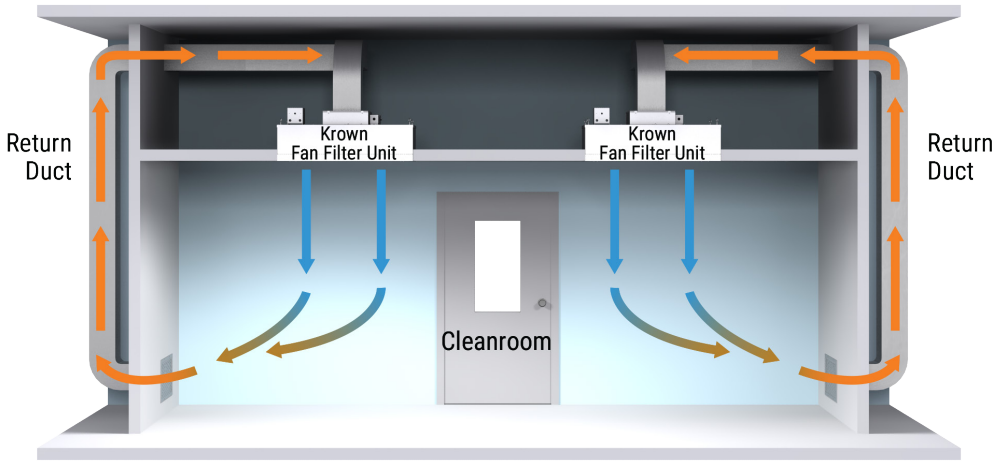
Repeat steps 4-6 until desired airflow and inlet pressure (0.0 ± 0.05" w.g.) is achieved..

FFU Airflow	FFU Inlet Static (measured)	Action
Above Set point	Above desired pressure	Decrease airflow on airflow control device
Above Set point	Below desired pressure	Decrease Krown Fan Filter Unit control setting
Above Set point	At desired pressure	Decrease Both Krown Fan Filter Unit and airflow control device
Below Set point	At desired pressure	Increase Both Krown Fan Filter Unit and airflow control device
Below Set point	Below desired pressure	Increase airflow on airflow control device
Below Set point	Above desired pressure	Increase Krown Fan Filter Unit control setting

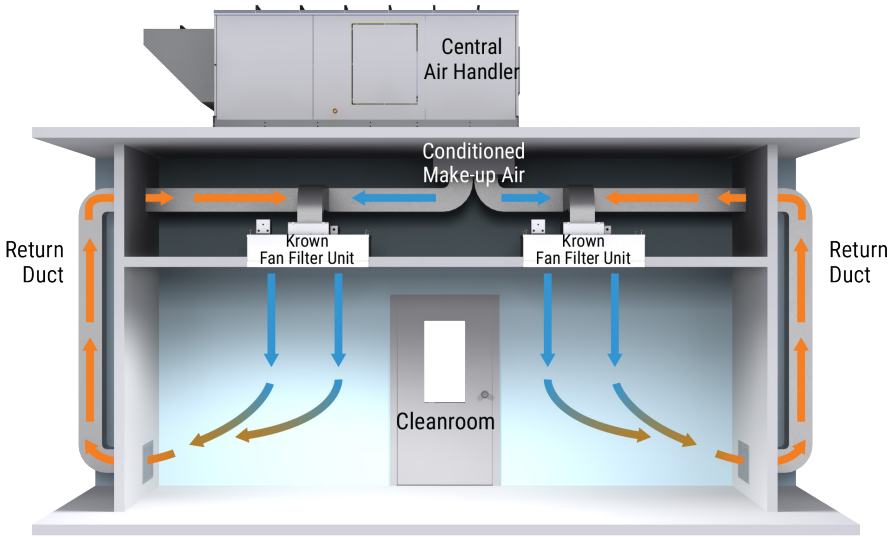
Balancing Ducted Supply – Pressure Independent and Dependent Airflow Control

NOTE: If a ducted return or return mixing box is used, a PSC, ECM Constant Torque or ECM Constant Flow (preferred) can be used.

Krown Fan Filter Units with Ducted Return



Krown Fan Filter Units with Return Mixing Box



Step 1: If return mixing box is used, turn primary air off. If ducted return, proceed directly to Step 2.

Step 2: Set Krown Fan Filter Unit to desired airflow. See *Airflow Setpoint* section to determine initial setpoint.

Step 3: Confirm airflow using flow hood and adjust speed controller as required.

Step 4: Power up the primary airflow control device. (Ductwork should have been previously balanced).

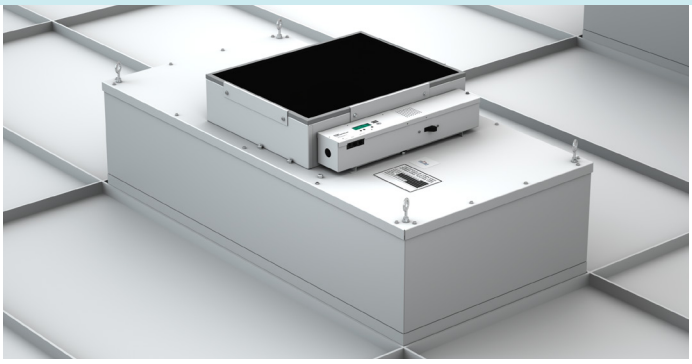
Step 5: Measure airflow using flow hood and compare against scheduled flow. Adjust speed controller as necessary to achieve design airflow.

Pre-Filter Cleaning

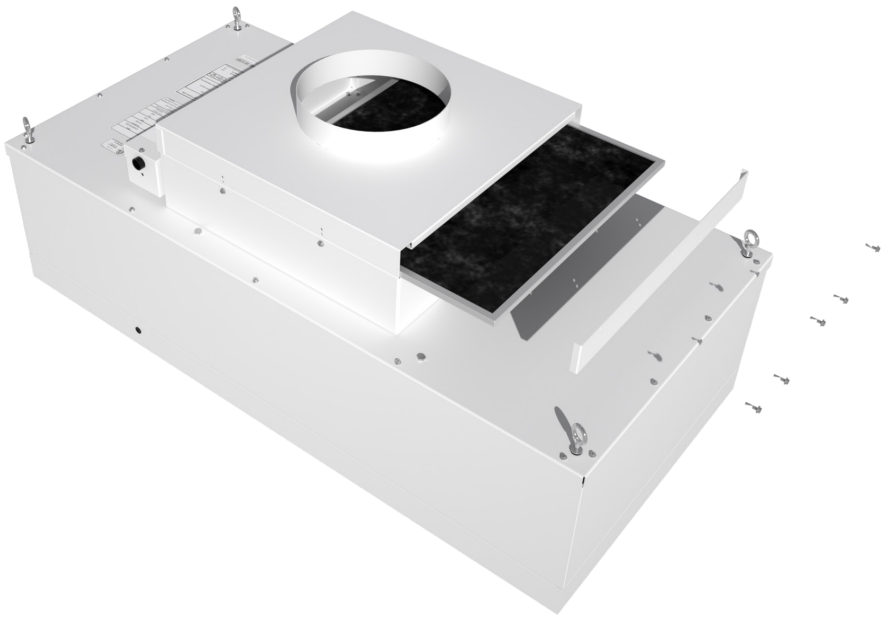
Step 1: Gain access to the top of the unit by removing adjacent ceiling, or access panel.

Step 2: Remove filter by pushing filter to one side and sliding it out from under the brackets (non-ducted), or remove filter access door (ducted). Reference the below figures for further details.

Un-Ducted Unit Filter Removal



Ducted Unit Filter Removal



Step 3: Clean pre-filter by hand washing in water with a mild detergent or by using a vacuum cleaner. Allow pre-filter to dry completely before replacing.

Step 4: Reverse above steps to install the pre-filter.

Motor Change

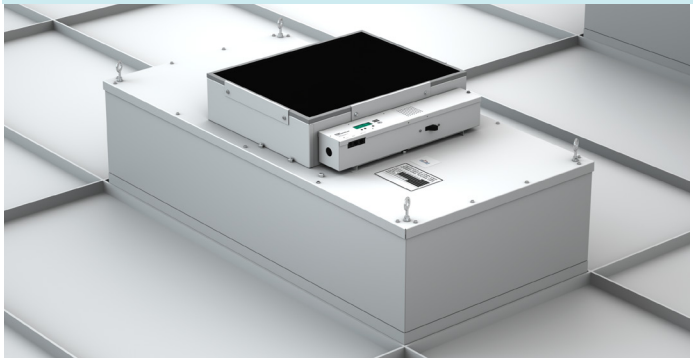
Top Access Motor/Blower Assembly

Sample line string: Krown-X-X//*I/24/48/RSR/BC/ECM/115/10//CT//HEPA//ECMSC//WK-ECMSC//DSW-115//PC-115//* ***TMB****/ASSP/INJ/////WPFH/PL-AL/F-AL//PL-B12/F-B12*

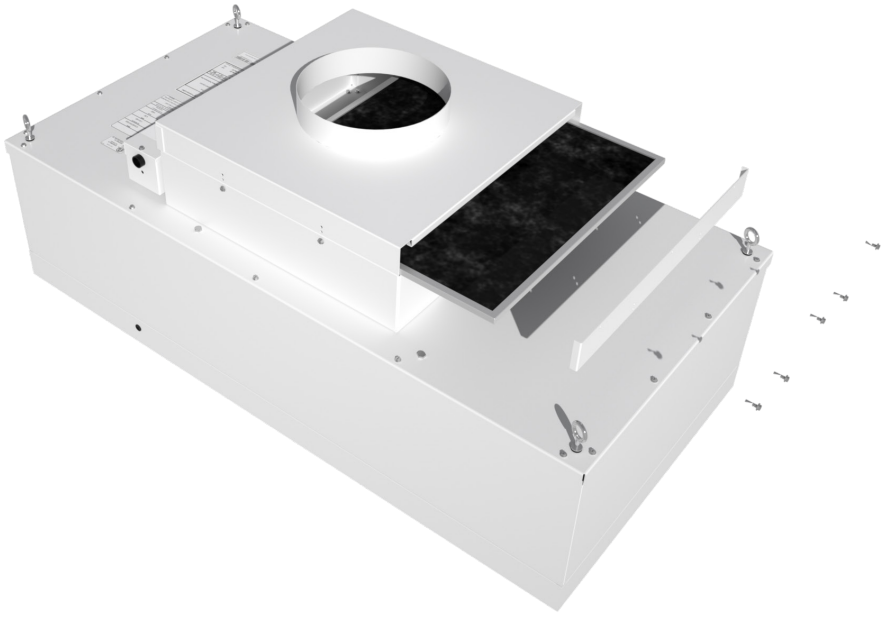
Step 1: Gain access to the top of the unit by removing adjacent ceiling, or access panel.

Step 2: Remove filter by pushing filter to one side and sliding it out from under the brackets (non-ducted), or remove the duct collar/pre-filter housing and pre-filter (if applicable) via screws (ducted) to expose motor assembly. Reference the below figures for further detail.

Un-Ducted Unit Filter Removal



Ducted Unit Filter Removal



Step 3: Make note of all wire locations for re-installation later. It is recommended to take a picture of all applicable wires.

Step 4: Open control box and disconnect wires at the terminal block, referencing applicable wiring diagram.

Step 5: Remove the screws to free the inlet collar with the motor/ blower assembly, using a 1/4" hex screw driver (or equivalent).

Step 6: Remove motor/blower assembly from the inlet collar by removing the 6 lock-nuts using a deep 7/16" socket wrench (or equivalent).

Step 7: Inspect and/or replace parts.

Step 8: Replace or reuse the motor/blower assembly and reassemble by reversing the above steps.

NOTE: For information on how to order replacement motor/blowers, *contact Keystone Clean Air Solutions.*

Step 9: Double check airflow to ensure that set point has not changed.

Motor - Blower Assembly

Room Side Accessible Motor/Blower Assembly

Sample line string: Krown-X-X//I/SUPPLY/24/48//RSR/HEPA/FC/ECM/115/CF/R+TMB/BACnet/BFC/TC/DSW-115/PC-115/ASSP/INJ//WPF/PL-AL/F-AL/PL-B12/F-B12

NOTE: Disconnect the unit from the electrical power source before attempting any service. Electrical service should be performed by a licensed electrician or authorized service technician.

NOTE: Disconnect the unit from the electrical power source before attempting any service. Electrical service should be performed by a licensed electrician or authorized service technician.

Step 1: Remove diffuser perforated face by turning quarter turn fasteners holding face in place.

NOTE: Safety cables will be attached to the diffuser face, but care should be taken to ensure that diffuser face does not swing and injure anyone.

Diffuser Face with Quarter Turn Fasteners

Step 2: Remove filter by loosening cam latch bolts (filter retainer clips) by turning counter clockwise using your hands, or hex key as required to fully tighten latches.

Step 3: Turn all cam latch filter retainers to the open position.

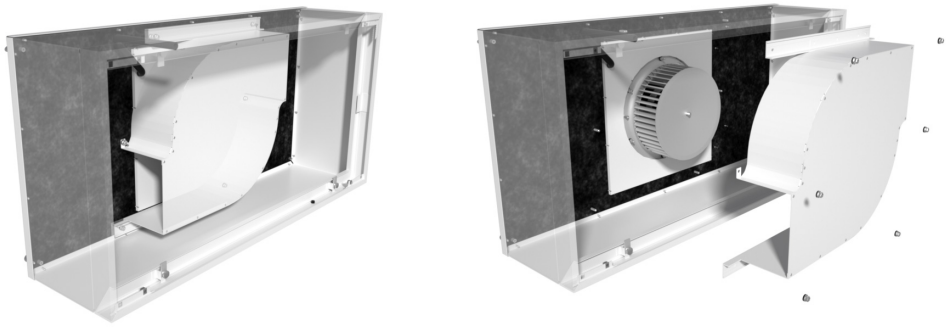
Step 4: Remove filter by handling frame; do not touch filter media.

Cam Latch Bolts

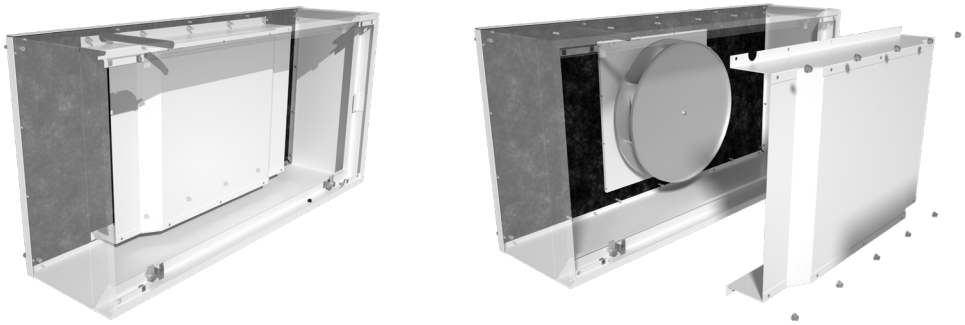
Step 5: Remove the nuts securing the blower housing using a deep 7/16" socket wrench (or equivalent).

NOTE: A 7/16" ratchet with extension is recommended for ease of access for unfastening.

2x3 and 2x4 forward curved blower housing



2x3 and 2x4 backward curved blower housing



2x2 forward curved blower housing

Step 6: Remove the housing exposing the motor/blower assembly.

Step 7: Remove motor/blower assembly from the inlet collar by removing the 6 lock-nuts using a deep 7/16" socket wrench (or equivalent).

Step 8: Drop motor/blower assembly out of unit. Be careful as wire connection are still in place.

Step 9: Disconnect plug and play connection connecting wires from motor to control box.

Step 10: Remove motor/blower assembly.

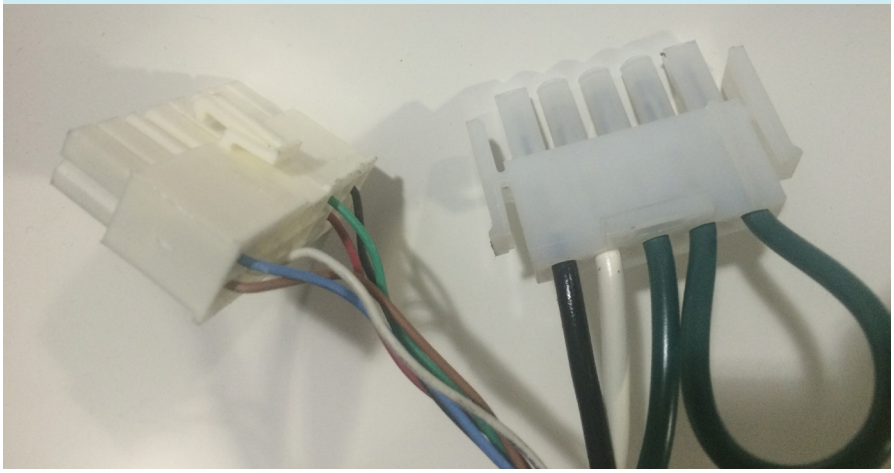
Step 11: Inspect and/or replace parts.

Step 12: Replace with the new motor/blower assembly and reassemble by reversing the above steps.

Step 13: Double check airflow to ensure that set point has not changed.

NOTE: For information on how to order replacement motor/blowers, contact Keystone Support at *KeySupport@KeystoneCleanAir.com* or *www.KeyStoneCleanAir.com*.

Speed Control and Motor Harness Cables 115V



Room Side Accessible Controls

Sample line string: Krown-X-X//I/SUPPLY/24/48//RSR/HEPA/FC/ECM/115/CF/R+TMB/BACnet/BFC/***R+TC***/DSW-115/PC-115/ASSP/INJ//WPF/PL-AL/F-AL/PL-B12/F-B12

Step 1: Remove diffuser perforated face by turning quarter turn fasteners holding face in place.

NOTE: Safety cables will be attached to the diffuser face, but care should be taken to ensure that diffuser face does not swing and injure anyone.

Diffuser Face with Quarter Turn Fasteners

Step 2: Remove filter by loosening cam latch bolts (filter retainer clips) by turning counter clockwise using your hands, or hex key as required to fully tighten latches.

Cam Latch Bolts

Step 3: Turn all cam latch filter retainers to the open position.

Step 4: Remove filter by handling frame; Extreme caution should be taken when removing the filter if the filter is to be reinstalled. Touch the filter by the frame only; never touch the filter media as it can damage the filter.

If your unit is 24 x 48" or 24 x 36", skip to Step 8.

Step 5: Remove the 2 nuts securing the baffle retainer bracket using a 7/16" socket wrench.

Location of Nuts

Step 6: Remove the 4 bolts securing the baffle on the opposite side of the retainer bracket using a 7/16" socket wrench.

Location of Bolts

Step 7: Carefully remove the baffle and the retainer bracket from the module.

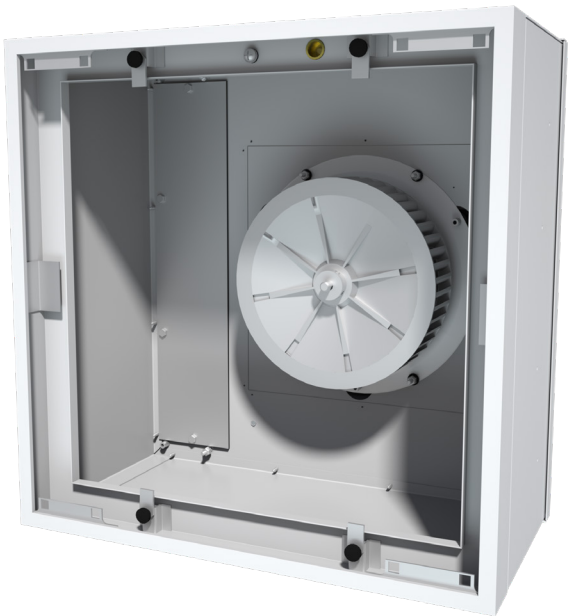
Baffle and retainer bracket removal

Step 8: For 24 x 36" units with BC option, remove the housing to access the control lid.

Step 9: Remove the control lid from the inside of the plenum using a 7/16" socket wrench for access to the control box.

Step 10: Reverse the previous steps taken to re-assemble the unit.

Control box



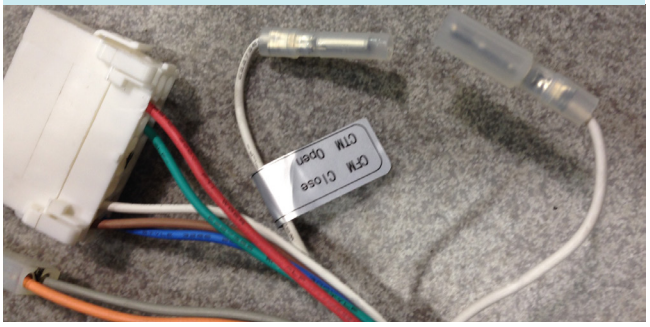
Troubleshooting – Changing Motor Programs

The motors have the ability to function as either constant flow or constant torque. This provides the ability to change motor programs without the need to reprogram the motor.

NOTE: Changes will only take effect upon restarting the motor (must be powered off and then back on) and cannot be made live.

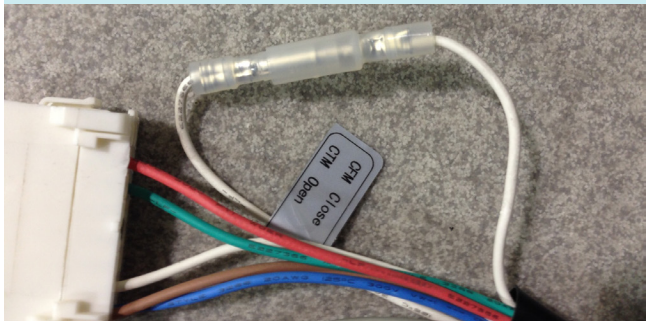
Switching from constant flow to constant torque: To switch the motor from constant flow to constant torque all that is required is to open the connection of the white wire as shown.

Motor Setting - Constant Torque



Switching from constant torque to constant flow: To switch the motor from constant torque to constant flow all that is required is to close the connection of the white wire as shown.

Motor Setting - Constant Flow



The motor will be factory wired to the motor program selected on the order.

NOTE: If using the BFC, please updated the BFC programming to reflect the change in motor program. Please refer to the *BFC manual* for instructions.

Troubleshooting Tips

Low Air Velocity	1. Check pre-filter media (only with optional pre-filter); replace or clean as necessary
	2. Adjust variable speed control for higher blower output.
	3. Check power for proper voltage, amperage, and distribution frequency.
	4. Replace HEPA/ULPA filter if the velocity remains low.
High Air Velocity	1. Adjust variable speed control for lower blower output.
Non-Laminar Flow and/or Excessive Contamination	1. Ensure that no large obstructions are upstream of airflow pattern.
	2. Determine that no other air-moving devices are operating in or around cleanroom which could disrupt the room's airflow pattern.
	3. Check air velocity and if low, conduct the 'Low Air Velocity' procedure outlined above.
	4. Conduct smoke and photometer test on HEPA/ULPA filter. Seal or replace.
Motor Keeps Shutting Off	1. Check if unit is ducted.
	2. If no, contact Price at criticalenvironments@priceindustries.com.
	3. If yes, check inlet pressure, if positive, re-balance until inlet pressure is zero.
LED Light Turned Red	1. Refer to 'Motor Will Not Run' procedure outlined below.
LED light Turned Yellow	1. Replace filter.
Motor Will Not Run	1. Check that motor has power at correct voltage.
	2. Check that the speed controller has power.
	3. Check control mode on speed controller and ensure setpoint is not 0%.
	4. Check control harness between speed controller and motor

If experiencing further issues with unit, contact Keystone Support at *KeySupport@KeystoneCleanAir.com* or *www.KeyStoneCleanAir.com*.

Filters

Size	Description	Part Number
2x2, RSR	HEPA - 2" Media - 20.69x20.69x2.88"	042299-020
	HEPA - 2.5" Media - 20.69x20.69x3.50"	042299-005
	ULPA - 2" Media - 20.69x20.69x2.88"	042299-017
	ULPA - 2.5" Media - 20.69x20.69x3.50"	042299-008
2x3, RSR	HEPA - 2" Media - 20.69x32.69x2.88"	042299-021
	HEPA - 2.5" Media - 20.69x32.69x3.50"	042299-006
	ULPA - 2" Media - 20.69x32.69x2.88"	042299-018
	ULPA - 2.5" Media - 20.69x32.69x3.50"	042299-009
2x4, RSR	HEPA - 2" Media - 20.69x44.69x2.88"	042299-022
	HEPA - 2.5" Media - 20.69x44.69x3.50"	042299-007
	ULPA - 2" Media - 20.69x44.69x2.88"	042299-019
	ULPA - 2.5" Media - 20.69x44.69x3.50"	042299-010
2x2, BTR	HEPA - 2.5" Media - 23.62x23.62x3.06"	042299-011
	ULPA - 2.5" Media - 23.62x23.62x3.06"	042299-014
2x3, BTR	HEPA - 2.5" Media - 23.62x35.62x3.06"	042299-012
	ULPA - 2.5" Media - 23.62x35.62x3.06"	042299-015
2x4, BTR	HEPA - 2.5" Media - 23.62x47.62x3.06"	042299-013
	ULPA - 2.5" Media - 23.62x47.62x3.06"	042299-016
2x3/2x4 SUPPLY PF	Washable Pre-filter - 19.5x19.5x0.437"	045964-003
	Washable Pre-filter - 15.5x19.5x0.437"	045964-004
	MERV8 Pre-filter - 19.5x19.5x0.75"	042313-044
	MERV8 Pre-filter - 15.5x19.5x0.75"	042313-043
2x2 SUPPLY PF	Washable Pre-filter - 15.5x15.5x0.437"	045964-005
	Washable Pre-filter - 15.5x19.5x0.437"	045964-004
	MERV8 Pre-filter - 15.5x15.5x0.75"	042313-055
	MERV8 Pre-filter - 15.5x19.5x0.75"	042313-043
Reverse/Exhaust Flow PF	2x2 - MERV8 Pre-filter - 19.5x19.5x0.75"	042313-044
	2x3 - MERV8 Pre-filter - 20.0x32.0x0.75"	042313-058
	2x3 - MERV8 Pre-filter - 20.0x44.0x0.75"	042313-056

Motor/Blower

Size	Description	Part Number
ECM Motor	115/208-240/277V - ECM Motor 1/3 HP	019219-001
PSC Motor	115V - PSC Motor 1/4 HP	019152-002
	208-240V - PSC Motor 1/4 HP	019589-002
	277V - PSC Motor 1/4 HP	019153-002
Blower Wheel	2x3/2x4 - Forward Curve Wheel	100090-002
	2x2 - Forward Curve Wheel	100080-001
	2x3/2x4 - Backward Curve Wheel	100090-003
ECM Motor + Blower Wheel	2x3/2x4 - ECM Motor - Forward Curve	503927-001
	2x2 - ECM Motor - Forward Curve	504176-001
	2x3/2x4 - ECM Motor - Backward Curve	503925-004
PSC Motor + Blower Wheel	2x3/2x4 - 115V - PSC Motor - Forward Curve	503927-014
	2x3/2x4 - 208-240V - PSC Motor - Forward Curve	503927-015
	2x3/2x4 - 277V - PSC Motor - Forward Curve	503927-016
	2x2 - 115V - PSC Motor - Forward Curve	504176-014
	2x2 - 208-240V - PSC Motor - Forward Curve	504176-015
	2x2 - 277V - PSC Motor - Forward Curve	504176-016
	2x3/2x4 - 115V - PSC Motor - Backward Curve	503925-014
	2x3/2x4 - 208-240V - PSC Motor - Backward Curve	503925-015
	2x3/2x4 - 277V - PSC Motor - Backward Curve	503925-016

Control Box Components

Size	Description	Part Number
Speed Controller	ECMSC - Standard ECM Speed Controller	232953-100
	BFC - BACnet Flow Controller	232953-241
	ECMSC/BFC - Wall Mounted Speed Controller (WMSC-30)	250061-300
	PSCSC - Standard PSC Speed Controller - 115V	233563-100
	PSCSC - Standard PSC Speed Controller - 208-240/277V	233563-200
	PSCSC-WK - PSC Wall Mounted Speed Controller - 115V	019543-003
	PSCSC-WK - PSC Wall Mounted Speed Controller - 208-240/277V	019543-004
Transformer	115V - 20VA Transformer	019436-004
	208-240V - 20VA Transformer	019436-013
	277V - 20VA Transformer	019436-007
Disconnect Switch	Single Pole - 15 Amp - 277V & 115V w/o PC Option	019903-001
	Dual Pole - 30 Amp - 208-240V & 115V w/ PC Option	019903-003
Power Cord	115V - 8 Foot Power Cable	019944-001
	277V - 6 Foot Power Cable	019944-002
Control Cable	ECMSC - 36" 4-Pin Control Cable	019186-019
	BFC - 36" 6-Pin Control Cable	019186-020
Power Harness	ECM - 115V - 30" Power Harness	019187-013
	ECM - 208-240/277V - 30" Power Harness	019187-014
	PSC - 115/208-240/277V - 30" Power Harness	019187-014
LED Cable	BFC - Tri-Colour LED	243912-300

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